

ASSIGNMENT 2

Textbook assignment: Chapter 3, "Basic Meters," pages 3-1 through 3-34. Chapter 4, "Common Test Equipment," pages 4-1 through 4-10.

- 2-1. What are the two basic components of a galvanometer?
1. A movable permanent magnet and a movable coil
 2. A stationary permanent magnet and a stationary coil
 3. A stationary permanent magnet and a movable coil
 4. A stationary coil and a movable coil
- 2-2. The coil in a galvanometer rotates to allow measurement of current. Which of the following actions causes this reaction?
1. Current flowing in opposite directions through two coils
 2. Tension of the hairspring and the magnetism produced by the permanent magnet
 3. Magnetism produced by current flowing in the movable coil and the tension of the hairspring
 4. Magnetism of the permanent magnet and magnetism produced by current in the movable coil
- 2-3. In a galvanometer, the phosphor bronze ribbon serves which of the following functions?
1. Provides a conduction path from the circuit being tested to the coil
 2. Restores the coil to its original position
 3. Allows the coil to twist
 4. Each of the above
- 2-4. In galvanometers, which of the following components is/are used to indicate the value of the current being measured?
1. Pointer
 2. Light and mirror
 3. Both 1 and 2 above
 4. Digital readout
- 2-5. The phosphor bronze ribbon in the galvanometer serves the same purpose as what component in the D'Arsonval meter?
1. Hairspring
 2. Movable coil
 3. Fixed iron core
 4. Permanent magnet
- 2-6. The direction in which the D'Arsonval meter pointer deflects depends on what characteristic of the current applied to the coil?
1. Phase
 2. Polarity
 3. Frequency
 4. Amplitude
- 2-7. The D'Arsonval meter movement is damped to prevent which of the following conditions?
1. Oscillating readings
 2. Inconsistent readings
 3. Consistently low readings
 4. Consistently high readings

- 2-8. The weight of the rotating coil assembly and the type of bearings used in the D'Arsonval meter are factors that affect which of the following characteristics of the meter?
1. The accuracy and the linearity of the meter scales
 2. The amount of restraining force required of the hairspring
 3. The maximum current that can be measured
 4. The sensitivity
- 2-9. For a meter to read linearly, its face is divided into equal segments. What meter feature makes this possible?
1. The curved poles of the permanent magnet
 2. The jeweled bearings in the meter movement
 3. An additional coil placed in the meter circuit
 4. A long, lightweight meter pointer
- 2-10. What is the purpose of a shunt in a dc ammeter?
1. To decrease the sensitivity of the meter
 2. To increase the linearity of the meter movement
 3. To increase the current range of the meter
 4. To decrease meter damping
- 2-11. A particular D'Arsonval meter has a full-scale current reading of 1 milliamperes. A full-scale reading of 100 milliamperes may be achieved by using which of the following components?
1. A low-value resistance placed in series with the meter terminals
 2. A high-value resistance placed in series with the meter terminals
 3. A movable coil composed of large-diameter wire
 4. A resistance of proper value placed in parallel with the meter terminals
- 2-12. To measure 10 milliamperes on a 1-milliamperes D'Arsonval meter movement, a shunt resistance is added that will carry 9 milliamperes. What maximum value of current will pass through the meter movement?
1. 1 milliamperes
 2. 3 milliamperes
 3. 6 milliamperes
 4. 9 milliamperes
- 2-13. In a meter movement, shunt strips with a zero temperature coefficient are used instead of regular carbon resistance for which of the following reasons?
1. Because regular carbon resistances cause interfering magnetic fields
 2. Because regular carbon resistances are too large to be used
 3. Because regular carbon resistances are not able to handle the current changes
 4. Because regular carbon resistances are affected by heat due to current and cause readings to vary
- 2-14. One consideration in choosing the value of a meter shunt resistance is that the meter readings should be in the midscale range. Which of the following factors is another consideration?
1. Meter switching is easier for midscale deflection
 2. Meter shielding against magnetic interference is greatest near midscale
 3. Minimum loading effect will be experienced near midscale
 4. The meter is protected from unexpected surge currents
- 2-15. For which of the following current ranges would you likely use a meter that contains internal shunt?
1. 1 to 10 amperes
 2. 11 to 30 amperes
 3. 31 to 50 amperes
 4. All of the above

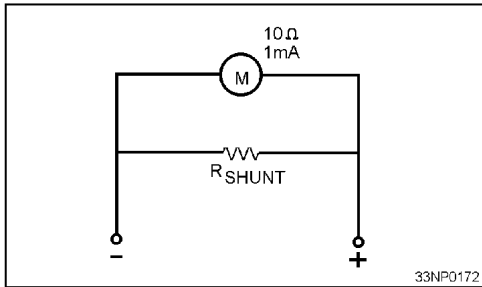


Figure 2A.—Shunt ammeter.

IN ANSWERING QUESTIONS 2-16 THROUGH 2-19, REFER TO FIGURE 2A. THE METER IN THE CIRCUIT IS DESIGNED FOR MAXIMUM OF .001 AMPERE AND HAS AN INTERNAL RESISTANCE OF 10 OHMS. YOU ARE FIGURING THE SHUNT RESISTANCE NECESSARY TO MEASURE 5 AMPERES.

2-16. What is the voltage drop across the meter coil?

1. .01 volt
2. .005 volt
3. .0001 volt
4. .0005 volt

2-17. What is the voltage drop across the shunt resistance?

1. .01 volt
2. .005 volt
3. .0001 volt
4. .0005 volt

2-18. When the meter is deflected full scale and is measuring 5 amperes, what is the maximum value of current flow through the shunt resistance?

1. 0.010 ampere
2. 0.490 ampere
3. 4.999 ampere
4. 5 amperes

2-19. What is the approximate value of the shunt resistance?

1. .001 ohm
2. .002 ohm
3. .003 ohm
4. .004 ohm

2-20. Simple range-switching arrangements for current meters are less satisfactory than other methods of range switching for which of the following reasons?

1. Meter damage can occur when line current momentarily flows through the meter
2. Resistance in the contacts may cause inaccurate readings
3. Both 1 and 2 above
4. Resistor damage may occur

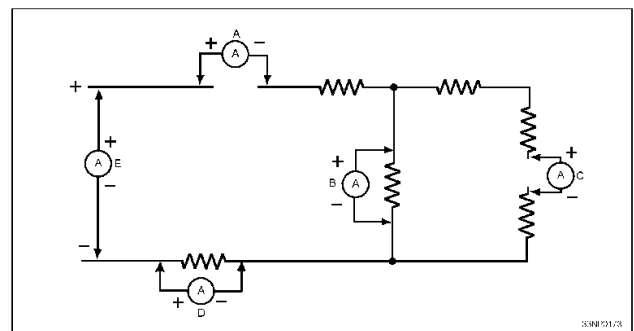


Figure 2B.—Ammeter connections.

IN ANSWERING QUESTION 2-21, REFER TO FIGURE 2B.

2-21. In the figure, five ammeters are connected to the circuit resistors. Of those five, which one(s) is/are connected correctly?

1. E only
2. A and E
3. A and C
4. A, B, and D

2-22. What will be the probable result of connecting an ammeter (or milliammeter) in PARALLEL with a source of voltage or a circuit component?

1. A burned-out meter that will provide no useful readings
2. A higher than normal meter reading
3. A lower than normal meter reading
4. A normal meter reading

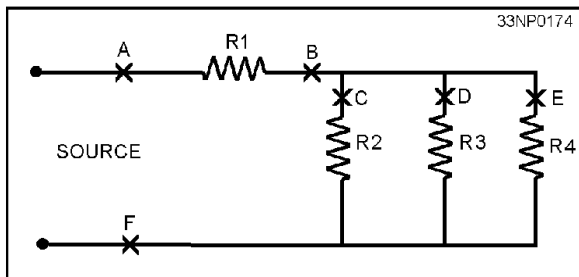


Figure 2C.—Series-parallel circuit.

IN ANSWERING QUESTIONS 2-23 AND 2-24, REFER TO FIGURE 2C.

2-23. To measure total circuit current, you should break the circuit to connect an ammeter at which of the following points?

1. A only
2. B or C
3. C, D, or E
4. A, B, or F

2-24. To measure the current flow through resistor R2 only, you should break which of the following points to connect the ammeter?

1. A
2. B
3. C
4. F

2-25. Meter sensitivity is determined by the amount of current required by the ammeter coil to provide full-scale deflection of the pointer. An ammeter coil requiring which of the following current values provides the greatest sensitivity?

1. 1 milliampere
2. 10 milliamperes
3. 100 microamperes
4. 500 microamperes

2-26. Circuits in which low-sensitivity ammeters are used are said to be "loaded." Which of the following statements describes the cause of circuit loading?

1. The ammeter circuit draws NO current from the circuit being tested
2. The ammeter circuit draws MINIMUM current from the circuit being tested
3. The ammeter circuit draws EXCESSIVE current from the circuit being tested
4. The ammeter circuit INDUCES current into the circuit being tested

2-27. In which of the following electronic circuits does the use of a meter with low sensitivity have the greatest loading effect?

1. High-power circuits
2. Low-current circuits
3. High-current circuits
4. High-voltage circuits

- 2-28. A basic D'Arsonval meter is used to measure voltage by connecting its meter coil to (a) what type of component in (b) what circuit arrangement?
1. (a) Multiplier resistor
(b) series
 2. (a) Multiplier resistor
(b) parallel
 3. (a) Capacitor
(b) parallel
 4. (a) Capacitor
(b) series
- 2-29. In a voltmeter, the D'Arsonval meter movement is caused to move by what electrical action?
1. Power
 2. Voltage
 3. Current
 4. Conductance
- 2-30. In a voltmeter, the meter scale is calibrated in which of the following categories?
1. Power
 2. Voltage
 3. Current
 4. Conductance
- 2-31. To figure the total value of series resistance needed to extend the range of a voltmeter, you need to know the value of current to cause full-scale deflection of the meter and what other value?
1. Minimum applied voltage
 2. Maximum applied voltage
 3. Maximum applied current
 4. Minimum applied current
- 2-32. Your voltmeter has four ranges: 1V, 10V, 100V, and 1,000V. To measure an unknown voltage in an amplifier, you should first select what range?
1. 1 V
 2. 10 V
 3. 100 V
 4. 1,000 V
- 2-33. Which of the following types of circuits are most affected by the loading effect of voltmeters?
1. Low-voltage
 2. Low-resistance
 3. High-resistance
 4. High-current
- 2-34. A voltmeter with a 10-microampere meter movement has a sensitivity of how many maximum ohms per volt?
1. 1,000
 2. 10,000
 3. 100,000
 4. 1,000,000
- 2-35. A megger is widely used for which of the following purposes?
1. To make voltage checks
 2. To make continuity checks
 3. To measure insulation resistance
 4. To measure resistance of components
- 2-36. Before you can take an accurate resistance measurement with an ohmmeter, what meter adjustment must you complete?
1. Zero voltage
 2. Zero resistance
 3. Maximum voltage
 4. Maximum resistance

2-37. When the leads of an ohmmeter are placed across a resistor, that resistor adds to the internal series coil resistance of the meter. The pointer is deflected to the left of its full-scale position, giving a reading in ohms for the resistor being tested. Which of the following reasons explains why the pointer moves to less than full-scale?

1. Because voltage in the meter circuit is greater than full-scale voltage
2. Because current in the meter circuit is greater than full-scale current
3. Because current in the meter circuit is less than full-scale current
4. Because voltage in the meter circuit is less than full-scale current

2-38. With the ohmmeter range switch set at R X 100, the pointer of the meter indicates 850. What is the actual value of the resistor?

1. 8.5 kilohms
2. 85 kilohms
3. 850 kilohms
4. 8.5 megohms

RANGE SCALE	RESISTOR VALUE
A. R×1	50 kilohms
B. R×10	500 kilohms
C. R×100	5 megohms

Figure 2D.—Range scales and resistance values.

IN ANSWERING QUESTION 2-39, REFER TO FIGURE 2D.

2-39. You are measuring resistors using range settings as shown in the figure. What condition listed in the figure, if any, will cause the greatest amount of current to move through the ohmmeter coil circuit?

1. A
2. B
3. C
4. None; they all allow the same amount of current

2-40. Which of the following locations on the meter scale provides the most accurate reading for resistance?

1. To the far left side of the scale
2. To the far right side of the scale
3. Halfway between the left side and center of the scale
4. Near the center of the scale

2-41. An ordinary ohmmeter is unsuitable for measuring insulation resistance for which of the following reasons?

1. Voltage is present in the conductors attached to the insulating materials being measured
2. Insulation resistance values are too great for an ohmmeter to measure
3. Ohmmeter current will damage insulation material
4. The accuracy of an ohmmeter is too low to measure insulation resistance

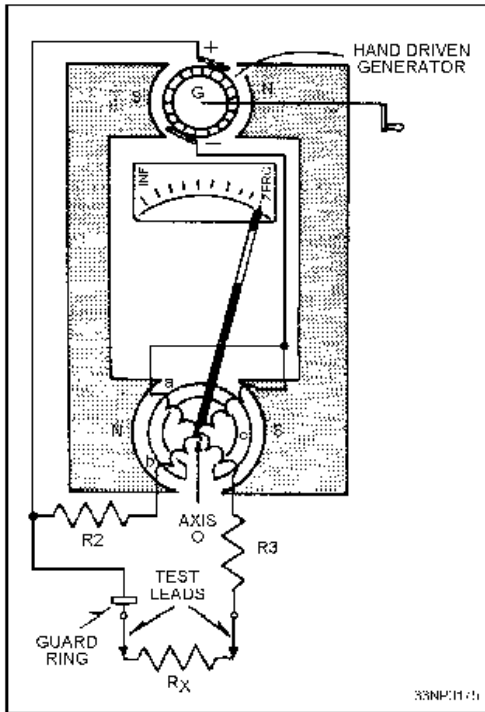


Figure 2E.—Megger circuit.

IN ANSWERING QUESTION 2-42, REFER TO FIGURE 2E.

- 2-42. In the megger circuit, what component prevents leakage current from affecting ohmmeter measurements?
1. Guard ring
 2. Generator
 3. Resistor R3
 4. Coil
- 2-43. When a megger is used to measure an unknown resistance, what circuit action causes the pointer to come to rest at the correct resistance value?
1. The current flow in coil A
 2. The current flow in coil B
 3. The interaction between the currents in coils A and B
 4. The interaction between the restraining springs of the meter and the current in coil A
- 2-44. A megger uses high voltage to check the insulation leakage in the megohm range. What is the source of this voltage?
1. Batteries
 2. The ship's ac power
 3. The ship's dc power
 4. A hand-driven dc generator
- 2-45. Meggers with which of the following maximum voltage ratings are commonly found in the fleet?
1. 500 volts
 2. 700 volts
 3. 1,000 volts
 4. 2,500 volts
- 2-46. When a megger is used to measure the resistance of an electrical cable, what does a reading of infinity indicate?
1. The meter is faulty
 2. The cable is shorted
 3. The cable is grounded
 4. The resistance is too large to measure
- 2-47. A megger is prevented from exceeding its rated output voltage by which of the following actions?
1. Battery discharge limits the voltage
 2. Tension in the cable
 3. Friction clutch slippage
 4. Current leaks through internal insulation
- 2-48. When the crank of a 500-volt megger is rotated faster than its designed rate, what maximum output voltage does it produce?
1. 100 volts
 2. 500 volts
 3. 520 volts
 4. 550 volts

2-49. The galvanometer-type meter movement differs from the electrodynamicometer meter movement in that the electrodynamicometer type uses which of the following components to produce the magnetic field?

1. Two sets of coils
2. Two permanent magnets
3. One fixed and one movable coil
4. One movable coil and one permanent magnet

2-50. The fixed coils in the electrodynamicometer-type movement are wound with heavy wire to enable the instrument to measure which of the following values?

1. Rf currents
2. High voltage
3. Large currents
4. High resistance

2-51. An advantage that the electrodynamicometer has over the standard galvanometer in measuring ac is that the electrodynamicometer requires

1. no rectifying device
2. a less complicated rectifying device
3. less current to obtain a full-scale deflection
4. fewer multiplier resistors to cover the measurement range

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2-52. When power is being measured with a wattmeter, why is it important to strictly observe the safe rating limits for current and voltage?

1. Because the meter pointer will likely hit against the upper limit of the dial and be damaged
2. Because the pointer does not give an indication to alert the user when the internal coils are overloaded
3. Because a false reading may be obtained
4. Because the meter pointer will likely hit against the lower limit of the dial and be damaged

2-53. The reading of a wattmeter is dependent upon which of the following circuit characteristics?

1. Current
2. Voltage
3. Power factor
4. All of the above

2-54. A continuity test is performed on a piece of electronic equipment to discover what kind of fault?

1. High voltage
2. Low voltage
3. Open circuits
4. Changes in component values

2-55. Which of the following meters is recommended for circuit continuity tests?

1. A megger
2. An ammeter
3. A voltmeter
4. An ohmmeter

2-56. When preparing to use an ohmmeter to test a circuit for grounds, you should first take which of the following actions?

1. Energize the circuit
2. Disconnect all intentional grounds
3. Measure the circuit voltage at the power source
4. Connect all intentional grounds

2-57. When preparing to use a voltmeter to measure voltage in a circuit, you should first take which of the following actions?

1. Set the meter to the lowest voltage range
2. Remove the suspected component from the circuit
3. Check the voltage from the power source to ensure it is correct
4. Check the current flow through the circuit with an ammeter

2-58. It is important to set a voltmeter on its highest range scale before taking a measurement for which of the following reasons?

1. To protect the meter from damage
2. To decrease the effects of input impedance
3. To increase the sensitivity of the measurement
4. To protect the equipment being tested from damage

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2-59. An accurate measurement of a particular resistor in a set of parallel resistors may be obtained by performing which of the following procedural steps?

1. Connecting the ohmmeter leads across the resistor while in place
2. Disconnecting the resistor from the set before taking the measurement
3. Grounding the resistance set before taking the measurement
4. Using the highest ohmmeter range

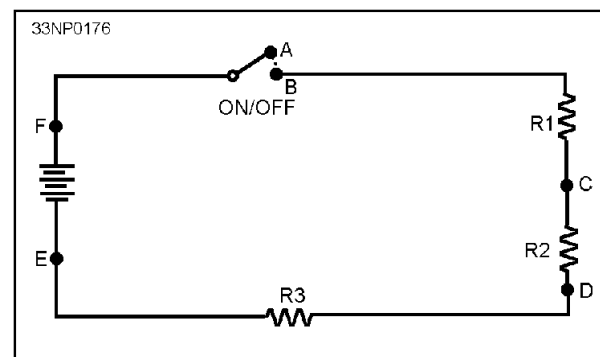


Figure 2F.—Circuit.

IN ANSWERING QUESTION 2-60, REFER
TO FIGURE 2F.

2-60. To measure R2 with an ohmmeter, (a) in what position should the ON/OFF switch be placed, and (b) where should the test probes be placed?

1. (a) Off (b) at B and C
2. (a) Off (b) at C and D
3. (a) On (b) at C and D
4. (a) On (b) at B and C

2-61. In what arrangement is an ammeter connected to a circuit?

1. In series
2. In parallel
3. In a series-parallel combination
4. In a parallel-series combination

2-62. When you are measuring voltage using a voltmeter, where should you stand to view the meter reading?

1. To the right of the meter only
2. To the left of the meter only
3. To the right or left of the meter, depending on your handedness
4. Directly in front of the meter

2-63. A multimeter is used to measure which of the following electrical properties?

1. Voltage
2. Current
3. Resistance
4. Each of the above

2-64. Which of the following characteristics is an advantage of a volt-ohm meter?

1. It replaces three separate meters
2. There are no calibrations to be made
3. It is the most accurate meter available
4. It cannot be damaged

- A. SELECT RANGE SCALE
B. SHORT ENDS OF PROBES TOGETHER
C. ZERO THE METER USING THE ZERO ADJUST CONTROL

Figure 2G.—Zeroadjust steps.

IN ANSWERING QUESTION 2-65, REFER TO FIGURE 2G.

2-65. Before you measure resistance, it is important that you calibrate (zero) the ohmmeter. In what order should the actions in the figure be performed?

1. A, B, and C
2. B, C, and A
3. C, B, and A
4. B, A, and C

2-66. On an ohmmeter, which of the following switches allows selection of ac or dc readings?

1. ZERO-OHMS
2. FUNCTION
3. RANGE
4. RESET

2-67. Which of the following actions MUST be taken before resistance measurements are made in a circuit?

1. All semiconductor devices must be removed from the circuit
2. Expected measurements must be recorded
3. The circuit must be completely de-energized
4. The high range of the ohmmeter must be selected

2-68. The power required to operate a basic ohmmeter comes from which of the following sources?

1. Batteries
2. An ac power supply
3. Both 1 and 2 above
4. A hand crank

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POINTER LOCATION	
1.	EXTREME RIGHT
2.	EXTREME LEFT
3.	MIDSCALE

Figure 2H.—Ohmmeter pointer location

IN ANSWERING QUESTIONS 2-69 THROUGH 2-72, REFER TO FIGURE 2H AND SELECT THE OHMMETER POINTER LOCATION THAT RESULTS FROM THE CONDITION GIVEN.

- 2-69. Both test leads are touching the metal chassis of a piece of equipment.
- 2-70. The test leads are shorted together.
- 2-71. The test leads are separated from each other and not touching anything else.
- 2-72. An accurate resistance reading is being made.
- 2-73. The function of the ZERO OHM control on a multimeter is to compensate for which of the following conditions?
 - 1. Meter battery aging
 - 2. Large values of resistance in the circuit to be measured
 - 3. Inter-electrode capacitance in the circuit to be measured
 - 4. Stray voltages in the circuit under test

- 2-74. When using a multimeter to measure an output voltage, you should ensure that the dc voltage component does not exceed what maximum voltage?

- 1. 100 volts
- 2. 200 volts
- 3. 300 volts
- 4. 400 volts

- 2-75. When measuring unknown currents, you should determine the range scale that is appropriate in what way?

- 1. Start with the expected scale
- 2. Start with the lowest scale and work up
- 3. Start with the highest scale and work down
- 4. Use the highest scale only